SOIL MECHANICS AND FOUNDATION ENGINEERING

•TEST -1 ESPECIALLY FOR RRB -JE AND SSC-JE

MOST EXPECTED QUESTION

25 MCQ AND 30 MINUTES

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1. Which of the following statements is correct
   a. Uniformity coefficient represents the shape of the particle size distribution curve
   b. For a well grade soil, both uniformity coefficient and coefficient of curvature are nearly unity.
   c. A soil is said to be well grade if it has most of the particles of about the same size
   d. None of the above

2. The following index properties were determined for four soils A, B, C and D

Soil Property	A	B	C	D
Liquid limit	0.50	0.49	0.43	0.47
Plastic limit	0.23	0.17	0.21	0.26

Which of these soils contains more clay particles ?
   a. Soil A
   b. Soil B
   c. Soil C
   d. Soil D

3. Match List I with List II and select the correct answer using the codes given below the lists:

List I (Bearing capacity terms)	List II (Definition)
A. ultimate bearing capacity	1. Net loading intensity at which neither soil fails in shear nor is there any excessive settlement
B. Net safe bearing capacity	2. The maximum pressure which soil can carry safely without risk of shear failure
C. Safe bearing capacity	3. Net ultimate bearing capacity divided by factor of safety
D. Allowable bearing pressure	4. Minimum gross pressure intensity at the base of foundation at which soil fails in shear

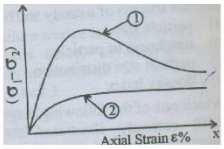
   a. A-4 B-3 C-2 D-1
   b. A-2 B-1 C-4 D-3
   c. A-4 B-2 C-3 D-1
   d. A-2 B-1 C-3 D-4

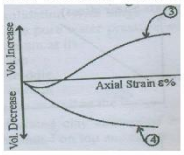
4. Figure 8.6 shows the contact pressure distribution in pure clayey soil subjected to a uniformly distributed load (udl) through rigid footing (placed on the surface

Which of the following would cause the contact pressure distribution maximum at the centre and decrease towards the outer edge leading to parabolic shape
   1. When udl is transmitted through rigid footing placed on the surface of a cohesionless soil
   2. When udl is transmitted through flexible footing placed on the surface of a cohesive soil.
   3. When udl is transmitted through flexible footing placed on the surface of a pure clay.

Select the correct answer using the codes given below
   a. 1, 2 and 3
   b. 1 and 2
   c. 2 and 3
   d. 1 alone

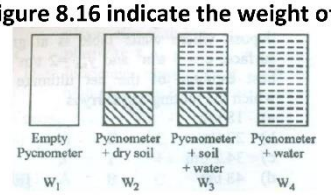
5. A CD traxial test is performed on a clay soil. Figures 8.11 (a) and (b) show two curves for deviator stress v/s axial strain % and volume change v/s axial strain % if the clay is overconsoildated, then the results would be as in curv





   a. 1 and 3
   b. 1 and 4
   c. 2 and 3
   d. 2 and 4

6. Figure 8.16 indicate the weight of different pynometers.



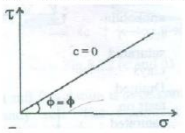
The specific gravity of solids is given by
   a. $\frac{W_2}{(W_4-W_2)}$
   b. $\frac{(W_2-W_1)}{(W_3\ W_4)\ (W_2\ W_1)}$
   c. $\frac{W_2}{(W_3-W_4)}$
   d. $\frac{(W_2-W_1)}{(W_2-W_1)-(W_3-W_4)}$

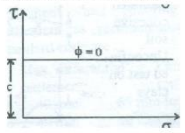
7. Consider the following statements in relation to the given sketch:

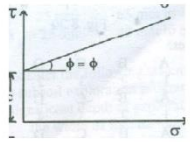
Volume. Cm³		Weight
0.2	Air	0
0.3	Water	0.3
0.5	solids	1.0

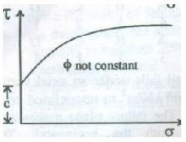
   1. Soil is partially saturated at degree of saturation = 60%
   2. Void ratio = 40%
   3. Water content = 30%
   4. Saturated unit weight = 1.5 g/cc.
   5. Of these statements
   a. 1, 2 and 3 are correct
   b. 1, 3 and 4 are correct
   c. 2, 3 and 4 are correct
   d. 1, 2 and 4 are correct

8. Which one of the following Fig 8.19 gives the failure envelope for a normally consolidated saturated clay sample tested in triaxial test under drained conditions?

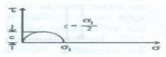
a. 

b. 

c. 

d. 

9. Match List I with List II and select the correct answer using the codes given below the lists:

List I (Type of shear tests)	List II (Mohr circle and its envelope)
A. Undrained test on normally consolidated	1. 
B. Consolidated undrained test on normally consolidated Saturated clays	2. 
C. Drained tests on saturated cohesive soil	3 
D. Unconfined test on clays	4. 

a. A-1 B-4 C-3 D-2
b. A-1 B-2 C-3 D-4
c. A-4 B-3 C-2 D-1
d. A-3 B-2 C-1 D-4

10. Match List I with List II and select the correct answer using the codes given below the lists:

List I (Effect)	List II (Reason)
A. Excessive settlement	1. Rise of water table
B. High Expansivity	2. High compressibility
C. Reduction bearing	3. Montmorillonite
D. Acceleration consolidation	4. Sand drains

a. A-4 B-1 C-2 D-3
b. A-2 B-3 C-4 D-1
c. A-4 B-1 C-3 D-2
d. A-2 B-3C-1 D-4

11. Consider the following statements:
1. 'Relative compaction' is not the same as 'relative density'
2. Vibrofloatation is not effective in the case of highly cohesive soils.
3. 'Zero air void line' and '100% saturation line' are not identical

Of these statements.
a. 1 and 2 are correct
b. 1 and 3 are correct
c. 2 and 3 are correct
d. 3 alone is correct

12. A soil has mass unit weight r, water content w (as ratio). the specific gravity of soils solids = G unit weight of water = r_w 'S' the degree of saturation of the soil is given by

a. $S = \frac{1+W}{\frac{r_w}{r}(1+W)-\frac{1}{G}}$
b. $S - \frac{W}{\frac{r_w}{r}(1+W)-\frac{1}{G}}$
c. $S = \frac{(1+W)}{\frac{r_w}{r}(1+W)\ \frac{1}{wG}}$
d. $S = \frac{W}{\frac{r_w}{r}(1+W)-\frac{1}{wG}}$

13. Consider the following statements:
Ranking's theory and Coulomb's theory give same values of coefficient of active and passive earth pressures when
1. the retaining wall has a vertical back
2. the backfill is cohesionless.
3. angle of slope of backfill is equal to the angle of internal friction
4. angle of slope of backfill is 0^0
5. angle of wall friction δ is 0^0
6. Angle of wall friction δ is equal to ϕ

Of these statements
a. 1, 2, 3 and 5 are correct
b. 1, 2, 4 and 5 are correct
c. 2, 3 and 6 are correct
d. 1, 4 and 6 are correct

14. A rectangular footing LxV is to be placed at a depth D below ground level such that D/B < 2.5. The factor N_c to be used in deciding on the allowable bearing capacity for the footing as given by Skempton is calculated using the equation (where $N_{cr} = N_C$ for rectangular footing, $N_{cs} = N_C$ at surface)

a. $N_{CR} = 1.5\ N_{CS}$
b. $N_{CR} = \left[1 + 0.2\frac{D}{B}\right] N_{CS}$
c. $N_{CR} = \left[1 + 0.2\frac{B}{L}\right] N_{CS}$
d. $N_{CR} = \left[1 + 0.2\frac{B}{L}\right]\left[1 + 0.2\frac{D}{B}\right] N_{CS}$

15. Consider the following statements associated local shear failure of soils:
1. Failure is sudden with well-defined ultimate load.
2. This failure occurs in highly compressible soils.
3. Failure is preceded by large settlement

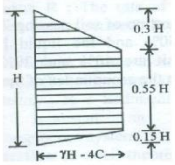
Of these statement
a. 1, 2 and 3 are correct
b. 1 and 2 are correct
c. 2 and 3 are correct
d. 1 and 3 are correct

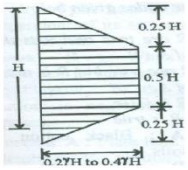
16. Match List I (Field problems) with List II (type of laboratory shear test) and select the correct answer using the codes given below the Lists

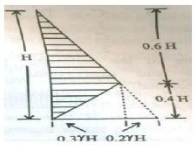
List I	List II
A. Stability of a clay foundation of an embankment, whose rate of construction is such that some consolidation occurs	1. nrained riaxial est
B. Initial stability of a footing on saturated clay	2. Drained triaxial test
C. Long-term stability of a slope in stiff, fissured clay	3. Consolidated undrained test
D. Foundation on soft marine clay deposits	4. Quick vane shear test

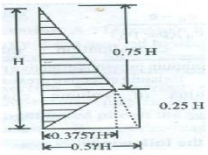
a. A-1 B-3 C-4 D-2
b. A-1 B-3 C-2 D-4
c. A-3 B-1 C-2 D-4
d. A-3 B-1 C-4 D-2

17. Which one of the following typical pressure distribution on braced sheeting in stiff clay with temporary support, as given by tschebotrioff

a. 

b. 

c. 

d. 

18. Which one of the following pairs of parameters and expressions is not correctly matched?

a. Coefficient of consolidation ..... $\frac{T_v H^2}{t}$
b. Coeff. Of volume compressibility.. $\frac{e_0 - e}{(1+e_0)(p-p_0)}$
c. Over consolidation ratio ..... $\sqrt{\frac{Maximum\ previous\ effective\ pressure}{Existing\ effective\ pressure}}$
d. Modulus of volume change.. $\frac{G_V}{1+e_0}$

19. If the proportion of soil passing 75 micron sieve is 50% and the liquid limit and plastic limit are 40% and 20% respectively then the group index of the soil is

a. 3.8
b. 6.5
c. 38
d. 65

20. To make certain that the backfill material is more pervious than the soil to be drained, the relationship used is

a. $(D_{15})_{filter} \leq 5\ (D_{85})_{protected\ soil}$
b. $(D_{15})_{filter} \geq 5\ (D_{85})_{protected\ soil}$
c. $(D_{15})_{filter} \leq 5\ (D_{15})_{protected\ soil}$
d. $(D_{15})_{filter} \geq 5\ (D_{15})_{protected\ soil}$

21. In hydrometer analysis for a soil mass

a. Both meniscus correction and dispersing agent correction are additive
b. Both meniscus correction and dispersing agent correction are subtractive
c. Meniscus correction is additive and dispersing agent correction is subtractive
d. Meniscus correction is subtractive and dispersing agent correction is additive

22. Select the correct statements.

a. A uniform soil has more strength and stability than a non-uniform soil
b. Decrease in liquid limit and no change in plasticity index
c. Decrease in both liquid limit and plasticity index
d. Increase in both liquid limit and plasticity index

23. If the material of the base of the casgrande liquid limit device on which the cup containing soil paste drops is softer than the standard hard rubber, then

a. The liquid limit of soil always increases
b. The liquid limit of soil always decreases
c. The liquid limit of soil may increase
d. The liquid limit of soil may decrease

24. terzaghi's basic differential equation for one dimensional consolidation of clayey soils is

a. $\frac{\partial \overline{u}}{\partial t} = C_v \frac{\partial \overline{u}}{\partial z}$

b. $\frac{\partial \overline{u}}{\partial z} = C_v \frac{\partial^2 \overline{u}}{\partial t^2}$

c. $\frac{\partial^2 \overline{u}}{\partial t^2} = C_v \frac{\partial \overline{u}}{\partial z}$

d. $\frac{\partial \overline{u}}{\partial t} = C_v \frac{\partial^2 \overline{u}}{\partial z^2}$

25. Direct measurement of permeability of the specimen at any stage of loading can be made

a. Only in fixed ring type consolidometer
b. Only in floating ring type consolidometer
c. Both (a) and (b)
d. None of the above